terials formerly containing asbestos have been replaced by substitutes. Still to be accomplished, however, is acceptance by primary care physicians that asbestosis is a potentially dangerous precancerous pulmonary disease even though a patient may be asymptomatic and feeling no symptoms of disability. Also physicians should observe workers who are exposed to *any* fibrous material. Carrying out periodic medical surveillance measures such as chest radiography, pulmonary function evaluation and physical examination in persons exposed to asbestos must become a way of life in these physician-patient relationships.

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Low Level Radiation Exposure

THE DANGERS AND EFFECTS of carrying out diagnostic x-ray examinations in humans require consideration of possible genetic and somatic risks. The genetic risk, less than the somatic risk, is small, and can be decreased by the use of gonadal shielding whenever possible. Protection of the ovaries, especially in women who are potential child-bearers, is carried out by shielding the pelvic cavity. Gonadal protection in males involves shielding the pelvic area except for the symphysis pubis.

What is the genetic risk? The best current estimates of hypothetical risk of an observable abnormality in a fetus from diagnostic radiation does not exceed 1 to 5 in a 1,000 rad-absorbed dose (the dose from 1,000 separate films of the abdomen). This is substantially less than the natural (cosmic-ray induced) incidence of 40 birth defects in 1,000 infants with birth anamolies who have not been exposed to diagnostic x-rays prenatally. The extra risk from diagnostic radiation, which in most instances is nowhere near 1,000 rads, is therefore negligible. Furthermore, it is not possible to state which observable birth anomaly may have been caused by cosmic radiation and which one may have been caused by diagnostic x-ray examinations.

The somatic risk of diagnostic x-ray examinations is easier to quantitate. This risk can be divided into two parts: prenatal exposure due to abdominal or pelvic study in a pregnant woman and postnatal exposure.

In cases of prenatal exposure, the third to sixth gestational weeks are probably the most critical; therefore, x-ray examinations should not be done during the first trimester of pregnancy. The guideline for exposure of fertile women to radiation indicates that the use of x-ray examinations should be determined on an individual basis. Concern over harmful effects should not prevent the proper use of radiation procedures when significant diagnostic information can be obtained.

The risk from postnatal exposure is limited to the carcinogenic effects due to diagnostic x-ray examinations. Children have an enhanced sensitivity to radiation compared with adults, but also require less exposure to produce a desired radiograph. Therefore, the risk estimates might be similar.

The dose from two x-ray films of the chest is approximately 45 mR. The chance of cancer developing in the area of the chest without extra radiation exposure is 1.5 in a million. Thus, a patient would have to undergo 1,950 x-ray examinations of the chest to increase his risk factor by 10 percent.

Xeromammography with two films of the breast gives an approximate skin dose of 2,000 mR. In a patient 35 to 50 years old there are 66 chances in a million that carcinoma of the breast will develop without mammograms, due to the known latency period for the cancer under consideration, which is generally taken to be 10 to 25 years. This patient would have to undergo 41 mammographic examinations to increase the risk factor by 10 percent. Therefore, it is apparent that the risk of carcinoma of the breast developing in women without x-ray examinations as a factor is significantly greater than the risk created by the exposure to radiation from the mammogram. However, we feel that in women under 34 years of age xeromammography should be done only if there is a strong family history of breast cancer, or indication of a lesion such as a suspicious breast lump. Routine xeromammography for women older than 34 years is recommended because the risk from the radiation is significantly decreased.

As can be seen, in most cases the risk from x-ray examinations is small, on the order of a few chances in a million for each examination. This

is roughly the same as the chance of being killed on a coast-to-coast plane ride on a regularly scheduled airline.

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Asymmetrical Hearing Loss

IT IS BELIEVED that between 5 and 6 million industrial workers in the United States have suffered serious loss of hearing from exposure to noise in the workplace. A hearing defect is usually defined as an average hearing loss of greater than 25 dB at frequencies of between 500 and 2,000 Hz. Some 10 percent of industrial workers in this country meet this criterion. The number would be increased to 50 percent if the definition included hearing losses at frequencies above 2,000 Hz. Among patients referred for assessment of compensation for presumed industrially-induced hearing losses, 15 percent have been found to suffer from unilateral or asymmetrical sensorineural hearing loss, with an average difference in hearing threshold between the two ears of 15 dB at frequencies of 500, 1,000 and 4,000 Hz. This condition should be investigated because it may be the first symptom of a variety of cochlear disorders or, more seriously, of retrocochlear disorders such as acoustic neuroma or a posterior fossa tumor.

In assessing the cause of asymmetrical hearing loss, several audiologic and otologic tests are done, including such conventional tests as air and bone conduction audiometry, stapedius reflex threshold estimation, reflex decay, speech reception threshold and speech discrimination and, in some cases, evoked response audiometry. Temporal bone tomograms are conducted to show the internal auditory meatus. Vestibular tests are often carried out as well. Any significant or unexplained abnormality is evaluated further by neurological examination, computerized axial tomographic (CAT) scanning or myelogram, or with repeated vestibular and hearing tests.

One major study of asymmetrical hearing loss attributed the cause to noise exposure in 34.5 percent of the cases reviewed. Three sources of asymmetrical loss of hearing in the workplace were proposed: (1) a sudden loud noise such as an explosion, which produced a massive loss of hearing in both ears, one of which recovered while the other did not; (2) a well-documented history of greater exposure to noise by one ear than the other, as, for example, the employee driving a tractor with one ear turned toward the exhaust, and (3) different sensitivity of the ears to the same sound, producing similar audiometric patterns but at different levels.

Even after considerable investigation, the yield of useful information on this condition is low. In a recent study, 108 patients were evaluated extensively for hearing loss: 87 underwent vestibular tests, 85 had internal canal tomograms done, 12 had myelograms done and 16 had brain scans. No treatable disorders were discovered. Thus, the cause appears to be noise exposure.

In view of the large number of potential cases of asymmetrical hearing loss and the apparent rarity of acoustic neuroma or angle tumor, the high cost of finding a single tumor may be prohibitive. On the basis of recent experience, a reasonable recommendation may be that in unexplained asymmetrical hearing thresholds, otologic and audiologic consultations should be obtained, as well as vestibular tests, x-ray studies of the temporal bone and advanced hearing tests as indicated. If the results of these tests offer no indication of a central pathological condition then neither CAT scans nor myelograms are recommended on a routine basis.

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Occupational Histories in Medical Care

IN THE 1700's Bernardino Ramazzini told us as physicians to ask one more question: "What is your work?" Today, this question is no longer adequate. From many points of view, a much more complete occupational history is recommended—for the protection of workers, management and physicians alike.

The relation of present findings to past occupations may be crucial. An expanding knowledge of occupationally related carcinogenesis rests on sound data regarding work exposures. Smoking patterns and avocations should also be included.

Various occupational risks affecting male and